In the Claims

1. (Original) A method of acquiring free-breathing MR images comprising the steps of:

monitoring heart rate of a subject just prior to image acquisition to acquire a time period of an R-R interval;

recording the time period from the heart rate monitoring to prospectively estimate future R-R intervals; and

acquiring n sets of MR data, a first MR data acquisition commencing at any point in an R-R interval and extending for the time period recorded.

2. (Original) The method of claim 1 further comprising the steps of segmenting each MR data acquisition into n segments and repetitively acquiring each segment in n successive heartbeats.

3. (Original) The method of claim 2 further comprising the step of combining the n MR data sets to form a set of MR images with high temporal resolution covering the R-R interval.

4. (Original) The method of claim 1 further comprising the step of discontinuing heart rate monitoring before acquiring MR image data.

5. (Original) The method of claim 1 wherein a second set of MR data is acquired immediately after the acquisition of the first set of MR data.

6. (Original) The method of claim 2 wherein n=1 for fluoroscopy imaging.

7. (Original) The method of claim 1 wherein the step of acquiring MR data is performed using one of a fast gradient-recalled echo pulse sequence and a steady state free precession pulse sequence.

8. (Original) The method of claim 1 further comprising the steps of:

subjecting a patient to successively increased, graded levels of cardiac stress during the monitoring step until the heart rate is stabilized at a required stress level; and

acquiring MR data according to the acquisition step of several long and short axis views of at least a portion of a heart muscle to monitor cardiac function during any portion of a stress test.

9. (Original) The method of claim 8 wherein the cardiac stress is induced either by physical stress or administration of a pharmaceutical.

10. (Currently Amended) A computer readable storage medium having a ~~A~~ computer program stored thereon for use with an MRI scanner having a computer, the computer program representing ~~having~~ a set of instructions that, when executed, causes the computer to:

receive a time-period signal indicative of an R-R interval representing a cardiac cycle of a patient;

acquire a first set of partial MR image data during a first acquisition period equal to the R-R interval;

acquire a second set of partial MR image data during a second acquisition period equal to the R-R interval; and

reconstruct an MR image by combining the first set of partial MR image data with the second set of partial MR image data.

11. (Currently Amended) The computer ~~program~~ readable storage medium of claim 10 ~~having further~~wherein the set of instructions further causes the computer to acquire n sets of partial MR image data, each frame of data in a partial MR data set being acquired at a similar time of a corresponding frame of data in each partial MR data set during the R-R interval.

12. (Currently Amended) The computer readable storage medium~~program~~ of claim 10 wherein the acquisition of MR data is not gated to an ECG trigger.

13. (Currently Amended) The computer readable storage medium~~program~~ of claim 10 wherein the acquisition of each set of partial MR data is acquired at a time irrespective of either one of an R-R interval start and end.

14. (Currently Amended) The computer readable storage medium ~~program~~ of claim 10 wherein each portion of MR data is a segment of an MR data set.

15. (Currently Amended) The computer readable storage medium ~~program~~ of claim 10 wherein one-half of k-space image data for a given segment is acquired during each R-R time period.

16. (Currently Amended) The computer readable storage medium~~program~~ of claim 10 wherein even and odd numbered lines of a k-space matrix are acquired in successive R-R intervals.

17. (Currently Amended) The computer readable storage medium~~program~~ of claim 10 ~~having further instructions~~wherein the set of instructions further causes the computer to monitor heart rate and generate an R-R time period indicative of a current R-R interval in a patient while the MR scanner is idle.

18. (Currently Amended) The computer readable storage medium~~program~~ of claim 10 ~~having further instructions~~wherein the set of instructions further causes the computer to periodically monitor heart rate and generate an R-R time period before and after each acquisition of MR data and not during any acquisition of MR data.

19. (Original) An MRI apparatus to acquire high-temporal resolution images comprising:

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images; and

a computer programmed to:

monitor heart rate of a patient;

acquire a time period of an R-R interval of the heart rate;

store the time period of the R-R interval;

enable the MRI system and begin an MR scan of the patient at an arbitrary time in the R-R interval;

continue to acquire MR data for a time comparable to the time period stored; and

reconstruct an MR image with the MR data acquired over at least one R-R interval as estimated by the time period stored.

20. (Original) The MRI apparatus of claim 19 wherein the computer is further programmed to:

segment data acquisition such that a portion of data is acquired during each acquisition; and

combine the segmented data acquired to reconstruct the MR image.

21. (Original) The MRI apparatus of claim 19 wherein the computer is further programmed to acquire n sets of MR data, each having m frames, where each frame is segmented into n segments and the m frames fit within one R-R interval.

22. (Original) The MRI apparatus of claim 19 wherein the computer is further programmed to apply one of a fast gradient-recalled echo pulse sequence and a steady state free precession pulse sequence.

23. (Original) The MRI apparatus of claim 19 wherein the computer is further programmed to acquire one-half of k-space image data for a given segment during each R-R time period.

24. (Original) The MRI apparatus of claim 19 wherein the computer is further programmed to acquire even and odd numbered lines of a k-space matrix in successive R-R intervals.

25. (Original) An examination method comprising the steps of:

subjecting a patient to successively increasing levels of cardiac stress;

monitoring heart rate;

once the heart rate is stabilized at a desired stress level, recording a time period of an R-R interval;

acquiring non-gated MR data using the time period recorded to estimate R-R intervals.

26. (Original) The examination method of claim 25 wherein the cardiac stress is induced by one of either physical exercise or administration of a pharmaceutical.

27. (Original) The examination method of claim 25 wherein the step of acquiring MR data includes acquiring segments of each frame of data over successive R-R intervals.

28. (Original) The examination method of claim 25 further comprising the step of combining the segments for each frame to reconstruct an image with high-temporal resolution without requiring patient breath-holding.

29. (Original) The examination method of claim 25 where a fraction of total k-space is acquired during each cardiac R-R interval.

30. (Original) The examination method of claim 29 where the step of acquiring MR data includes acquiring segments of each frame of data over successive n R-R intervals in order to complete data acquisition for a CINE data set.

31. (Original) The examination method of claim 30 further comprising repeating the acquisition to provide an updated CINE data set every n R-R intervals.

32. (Original) The examination method of claim 31 further comprising displaying continuous cardiac wall motion activity in order for an operator to monitor cardiac wall motion in real-time.